REMARKS

Claims 1 through 31 are pending in the application. Claims 30 and 31 have been withdrawn from consideration. Claims 5 and 14 have been amended primarily as a matter of form.

Claims 5, 6 and 14 through 18 are rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter regarded as the invention by Applicants.

The Action contends that claim 5 is indefinite as to the phrase "various ammonium salts, such as" because the phrase "such as" renders the claim unclear whether the limitations following the phrase are part of the claimed invention. Applicants respectfully submit that claim 5 has been amended to delete the terms "various" and "such as" from the claim, thus rendering the claim definite.

The Action contends, with respect to claim 14, that the phrase "the copper removal rate" lacks antecedent basis. Applicants have amended claim 14 to read, in relevant part, "...a copper removal rate of said slurry composition." As such, it is respectfully submitted that claim 14 is definite.

Therefore, Applicants respectfully request reconsideration and withdrawal of the §112, second paragraph rejections of claims 5 and 14, and claim 6, which depends from claim 5 and claims 15 through 18, which depend from claim 14.

Claims 1 through 29 are rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,136,711 to Grumbine et al. (Grumbine) in view of U.S. Patent Application Publication No. 2002/0032987A1 to Steckenrider et al. (Steckenrider) and U.S. Patent Application Publication No. 2002/0003225A1 to Hampden-Smith et al. (Hampden-Smith).

Grumbine discloses a CMP composition having an abrasive, an oxidizer, a corrosion inhibitor, and a tungsten inhibitor. Grumbine discloses that the abrasive may be a metal oxide abrasive consisting of metal oxide aggregates having a size distribution less than about 1.0 micron and a mean aggregate diameter less than about 0.4 micron (col. 7, line 66 - Col. 8, line 2). The metal oxide abrasive may consist of discrete, individual metal oxide particles having a primary Particle diameter less than 0.4 micron (Col. 8, lines 18-20). Grumbine discloses filtering the dispersion before adding the remaining ingredients that make up the CMP composition (Col. 12, lines 50-55).

Steckenrider discloses an aqueous CMP slurry for polishing the polysilicon layer of a semiconductor wafer. The slurry includes an aqueous solution of at least one abrasive and at least one alcoholamine. The abrasive is a metal oxide abrasive that consists of metal oxide particles having a size distribution less than about 1.0 micron and a mean particle diameter less than about 0.4 micron (Sections [0023-0024]).

Hampden-Smith discloses slurries having an abrasive powder. The abrasive powder has a small average particle size, controlled particle size distribution, spherical morphology, and is substantially unagglomerated.

Claim 1 is directed to a slurry composition for chemical and mechanical polishing. The slurry composition includes a dispersion comprising an abrasive and an oxidizer. The dispersion has a large particle count of less than about 150,000 particles having a particle size of greater than about 0.5 μm in a 30 μL sample.

Claim 26 is directed to a slurry composition for the chemical mechanical polishing of metal layers. The composition includes a silica dispersion; an oxidizer; a chemical activity enhancer; a pH adjuster; and a corrosion inhibitor. The silica dispersion has a large particle count of less than about 150,000 particles having a particle size greater than about 0.5μm in a 30 μL sample.

Claim 27 is directed to a method of preparing a chemical mechanical polishing slurry composition. The method includes the steps of admixing a chemical mechanical polishing slurry composition comprising a silica dispersion and an oxidizer; and filtering the chemical mechanical polishing slurry composition such that the large particle count in the composition is less than about 150,000 particles having a particle size greater than about 0.5 μm in about 30 μL of sample.

It is respectfully submitted that the Action fails to establish a prima facie case of obviousness. To establish a prima facie case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on Applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed.Cir 1991).

As recognized by the Action, "the reference [Grumbine] does not define the 'large particle count...of a size greater than about 0.5 microns'...". In fact, nowhere in Grumbine is large particle count remotely disclosed or suggested. Moreover, Applicants respectfully disagree with the Action's contention that the disclosure in Grumbine of the size of the abrasive particles encompasses and makes obvious the instant claims. The instant claims recite :..."less than 150,000...", which the Action notes 'less than' reads on zero.

As is well known to those of ordinary skill in the art, the term Large Particle Count refers to the formation of aggregates and agglomeration in slurry compositions. Large particle counts are generally caused by environmental conditions during shipment, slurry drying, and/or distribution system components including pumps, valves, piping, etc. Agglomeration and aggregates present a problem to semiconductor processing

because they cause micro-scratches on the surface of semiconductor devices. A large particle count is a measure or count of particles of an average diameter size of a distribution of particles, and not a specific size measurement of any particular particulate component in a slurry, such as an abrasive. (see e.g., specification, page 5)

While the cited prior art references disclose compositions having an abrasive component with a size less than 0.4 microns, this does not meet the limitation recited in the present claims, namely a composition having a large particle count of less than about 150,000 particles having a particle size of greater than about 0.5 microns in a 30 microliter sample. As noted above, large particle count is not a measure of the size of a specific particulate component, such as the metal oxide abrasive in Grumbine, but is a measure or count of any particles (i.e., agglomerates, aggregates, colloids, etc.) of a given size in a distribution of particles throughout the composition. Nowhere in Grumbine, Steckenrider or Hampden-Smith, taken either alone or in combination, is a large particle count disclosed or even suggested.

Even if one were to assume that the large particle count of the presently claimed composition was zero, as suggested by the Action, the cited prior art still would not render the present claims obvious. Again, the prior art fails to disclose or suggest any large particle counts in CMP compositions, as recited in the present claims. Therefore, the recitation of a composition having zero (which according to the Action is inclusive of the phrase "less than" recited in the present claims) particles with a particle size of greater than 0.5 microns in a 30 microliter sample is also not disclosed or suggested by the cited art. The disclosure of a composition having metal oxide abrasive particles less than 0.4 microns is not the equivalent to large particle count, as set forth above.

Moreover, the cited art clearly fails to appreciate the benefits conferred on the claimed compositions having the claimed large particle counts. The exceptional characteristics of the compositions of the claimed invention are demonstrated in Tables 1 and 2 on page 7 of the specification, which clearly indicates the superior attributes of the claimed composition over compositions not having the claimed large particle count.

Since none of the cited references, either alone or in combination, disclose or suggest a slurry composition with a large particle count, as recited in the present claims, it follows that the Action has failed to establish a prima facie case of obviousness. As such, reconsideration and withdrawal of the §103 rejection of claim 1 through 29 is respectfully requested.

Claims 1 through 26 are rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,063,306 to Kaufman et al. (Kaufman) in view of Hampden-Smith.

Kaufman discloses a first CMP slurry including an abrasive, an oxidizing agent, a complexing agent, a film forming agent and an organic amino compound, and a second polishing slurry including an abrasive, an oxidizing agent, and acetic acid, and a method for using the first and second polishing slurries sequentially to polish a substrate. Kaufman discloses that the abrasive is a metal oxide abrasive having a diameter less than about 0.4 micron.

It is respectfully submitted that the Action fails to establish a prima facie case of obviousness, in that the cited references taken either alone or in combination fail to teach or suggest all of the claim limitations. Consistent with the arguments set forth above, which apply equally to this rejection, Applicants respectfully submit that Kaufman fails to disclose or suggest any composition with a distinct large particle count, let alone a composition with a large particle count of less than 150,000 particles having a particle size of greater than about 0.5 microns in a 30 microliter sample, as recited in the present claims. Moreover, Hampden-Smith does not cure the deficiency in Kaufman, in that it also fails to remotely disclose or suggest a composition with a large particle count, as recited in the present claims. Again, the Action relies on the misplaced assertion that the diameter size of the abrasive particles disclosed in Kaufman reads on the large particle count limitation recited in the present claims. As noted above, the size of the abrasive particles in the Kaufman composition is not equivalent to the large particle count, therefore, it cannot render the claims of the present invention obvious.

Therefore, reconsideration and withdrawal of the §103(a) rejection of claims 1 through 29 is respectfully requested.

Claims 1 through 6, 24, 25 and 27 through 29 are rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,325,705 to Burke et al. (Burke) in view of Kaufman.

Burke discloses a CMP slurry made by mixing a ferric salt oxidizer with a solution to produce a mixture, filtering the mixture to remove preexisting particles that exceed a selected particle size, adding a suspension agent to the mixture, and adding abrasive particles to the mixture after filtering the mixture.

For the same reasons noted above, it is respectfully submitted that Burke, taken either alone or in combination with Kaufman, fails to disclose or suggest a slurry composition with a large particle count of less than about 150,000 particles having a particle size of greater than about 0.5 microns in a 30 microliter sample, as recited in the present claims. The Action relies on Figs. 1 and 2, and in col. 3, line 17 through col. 4, line 22, in Burke, to establish obviousness. However, upon careful evaluation of these citations, it is clear that the data summarized in Figs. 1 and 2 shows the results of liquid particle counts taken before and after filtering a ferric nitrate solution only, and not an abrasive dispersion and/or a CMP composition, as in the present invention. The disclosure in columns 3 and 4 support this, in that it is the primary thrust of the invention in Burke to eliminate "preexisting particles" that exist in a mixture of an oxidizing agent (ferric nitrate) and a solution before the desired abrasive particles are added. Burke clearly defines "preexisting particles" as undisolved oxidizing agent, contaminants and/or reaction products formed in the mixture. The specifically disclose dust as a contaminant and organo nitric compound as a reaction product when ferric nitrate oxidizer is used.

Nowhere in Burke is a slurry composition having a dispersion with a large particle count, as recited in claim 1, either disclosed or suggested. Moreover, nowhere in Burke is a slurry composition having a large particle count, as recited in claim 27, either

disclosed or suggested. The disclosure of preexisting particles and subsequent data set forth in Figs. 1 and 2 are associated only with ferric nitrate solutions.

Burke never suggests or contemplates a slurry composition having the large particle count features recited in claims 1 and 27. Moreover, as set forth above, Kaufman also fails to disclose or suggest any composition having the claimed large particle count. Therefore, Kaufman does not cure the deficiency of Burke.

The Action also contends that the method of making the slurry, as recited in claim 27, is rendered obvious by the disclosure in Burke. Namely, the Action states that although the filtering step in Burke takes place before the addition of the abrasive particle, no distinction is seen to exist because "reversing the order of steps in a process does not impart patentability when no unexpected result is obtained.

What the Action ignores is that Burke's filtration step must be done prior to the addition of the abrasive. Referring to Burke at col. 3, lines 24-29, Burke states that preferably, the filtering removes most of the preexisting particles that exceed a particle size of about 0.1 microns. Burke then goes on to disclose that most of the abrasive particles have a particle size in the range of 0.2 to 0.7 microns. If the filtering step in Burke was to occur after the addition of the abrasive, the filtering would not only remove most of the preexisting particles that exceed a particle size of about 0.1 microns, it would also remove most if not all of the abrasive particles, since they are between 0.2 and 0.7 microns. The resulting slurry would then be void of abrasive. Therefore, the only teaching in Burke is to filter the oxidizing solution prior to the addition of the abrasive, and never after the addition of the abrasive. This is contrary to the claimed invention, and one skilled in the art would never be motivated to filter anything but the oxidizing agent solution based on the teachings of Burke.

As such, it is respectfully submitted that claims 1 and 27, as well as claims 2 through 6, 24 and 25, which depend from claim 1, and claims 28 and 29, which depend from claim 27, are patentably distinguishable over Burke, taken either alone or in

combination. Therefore, reconsideration and withdrawal of the §103(a) rejection of these claims is respectfully requested.

Claims 1 through 8, 14, 15 and 17 through 25 are rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,461,227 to Fang in view of Kaufman.

Fang discloses a polishing system having a polishing composition comprising water, an oxidizing agent, and a complexing agent selected from the group consisting of ammonia, halide ions, and mixtures thereof; and a polishing pad and/or an abrasive. The abrasive particles of the polishing system, especially when formulated as a "fine", desirably are such that about 90% or more of the abrasive particles (by number) have a particle size no greater than 100nm.

Fang, like the previously cited prior art references, again fails to disclose or suggest any slurry composition having a large particle count of less than about 150,000 particles having a particle size of greater than about 0.5 microns in a 30 microliter solution, as recited in claim 1. As noted above, the particles measured in the large particle count are all particles (i.e., agglomerates, aggregates), and not just specific particulate components, such a metal oxide abrasives, as in Fang. Fang is clearly silent as to the large particle count of its polishing composition, and does not even contemplate such a feature in its invention. Moreover, as noted above, Kaufman also fails to disclose or suggest any composition with a large particle count, as recited in claim 1. As such, Kaufman fails to cure the deficiency of Fang.

It is respectfully submitted that claim 1, as well as claims 2 through 8, 14, 15 and 17 through 25, which depend from claim 1, are patentably distinguishable over Fang, taken either alone or in combination. As such, reconsideration and withdrawal of the §103(a) rejection of these claims is respectfully requested.

Claims 1 through 7 and 9 through 29 are rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,171,352 to Lee et al. (Lee) in view of Kaufman and Hampden-Smith.

Lee discloses a chemical mechanical abrasive composition for semiconductor processing. The composition includes 70-95 wt.% of an aqueous medium, 1-25 wt.% of an abrasive, and 0.1-20 wt.% of an abrasion accelerator. Lee discloses filtering the slurry to obtain a composition that has a solid content of about 9% by weight.

Lee fails to disclose or suggest any slurry composition having a large particle count of less than about 150,000 particles having a particle size of greater than about 0.5 microns in a 30 microliter solution, as recited in claims 1, 26 and 27. The arguments set forth above with respect to the other claim rejections apply equally to this rejection. Moreover, as noted above, both Kaufman and Hampden-Smith also fail to disclose or suggest any composition with a large particle count, as recited in claims 1, 26 and 27. As such, both Kaufman and Hampden-Smith fail to cure the deficiency of Lee.

It is respectfully submitted that claims 1 through 29 are patentably distinguishable over Lee, taken either alone or in combination. As such, reconsideration and withdrawal of the §103(a) rejection of these claims is respectfully requested.

Overall, Applicant's respectfully submit that claims 1 through 29 are patentably distinguishable over the cited art, taken either alone or in combination. As such, reconsideration and withdrawal of the rejections of these claims is respectfully requested.

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Respectfully submitted,

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